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ABSTRACT

The study examined the academic growth of students (N=326) identified as learning disabled since 1981 in a 9-county area of Iowa. All students in the study had been given at least one academic achievement test twice and the second testing was at least 90 days but not more than 1095 days after the first testing. The basic measure of growth was the change in norm-referenced scores over time. Results of comparing the two test scores showed that very little change occurred, and there was no evidence of differences based on factors such as district size, sex, time period difference, special education program type, or the specific learning disability. Though there was no evidence that students were improving relative to regular education peers, there was also no evidence of decline. (Author/DB)

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ACADEMIC GROWTH MADE BY LEARNING DISABLED STUDENTS

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ABSTRACT

The present project is an initial attempt to measure the academic growth being made by students identified as learning disabled. The project involved a review of the records of all students identified as LD since 1981 in a 9-county area, recording performance on standardized achievement tests. The basic measure of growth was the change in norm-referenced scores over time. The results showed that very little change occured, and there was no evidence of differences based on factors such as district size, sex, the specific learning disability, etc. Thus, while students were not improving, relative to their regular education peers, there was no evidence of further decline. The results demonstrate the need for better and more consistent ways of measuring student growth.

In recent years, there has been a tremendous growth in the number of students identified as learning disabled (Kirk and Gallagher, 1983; Chalfant, 1984), a fact which creates some concern for special educators. Partly as a result of this, important questions are being raised about such things as the nature of learning disabilities (Dannenbring, Note 1; DeRuiter and Wansart, 1982; Kavale and Forness, 1985; Torgesen, 1985; Torgesen and Licht, 1983; Vellutino, 1979), identification criteria (Ysseldyke and Thurlow, 1983), and the nature and quality of the services being provided. The focus of the present study was on the last of these topics. More specifically, this study represents an initial attempt to measure the academic progress being made by students identified as learning disabled.

Considering the large numbers of students identified as LD, and the large amount of money spent on their programs, it is rather amazing that there has been little research looking at the academic progress made by these students. Most of the literature consists of unpublished program evaluations (Bersell and Balliet, 1981, 1982; Evans and Wozney, 1977; Norris, Goodwin, Wheeler and Finley, 1981; Price and Goodman, 1977; Tobias, Reichman and Francois, 1981). The results of these studies are mixed, but generally report positive gains on the part of the students. This is rather interesting, especially given conclusions such as that of Ysseldyke and Algozzine (1983) that LD programs have been completely ineffective.

A closer look at some of these studies reveals problems which make interpretation and generalization difficult. Norris, et al (1981) evaluate an LD/ED program, with a general conclusion that it has been a good program, although the academic gains made by students would appear to be marginal (approximately 2 - 6 months per academic year). Tobias, et al (1981) report

successful academic progress being made by students receiving Title I reading and math support. Unfortunately, their measure of growth was the number of new skills mastered, which was not norm referenced, thus greatly diminishing the extent to which these data can be generalized.

Probably one of the most critical problems, however, is that the criteria used to identify LD students vary considerably from state to state and (depending upon the state) from district to district. The criteria used to place children in the LD programs described in these studies are not clearly stated. Thus, the extent to which these data may be generalized to other locations which use different selection criteria is questionable. It is important, then, that evaluations of student growth be conducted in a variety of locations. In Iowa, the criteria used to identify LD students (Iowa Department of Public Instruction, 1981) are more rigorous and precise than those used in most states. The present study is designed to look at the academic progress being made by students identified as LD under these criteria; hopefully, their growth will continue to be measured on an annual basis, which will ultimately result in a longitudinal picture of academic progress.

METHOD

Student Population

Data were collected on all students identified as LD within the participating districts in Arrowhead Area Education Agency (serving a nine-county area in Iowa). Only students identified (or re-evaluated) during or following the 1981 - 82 academic year were included in the study. The reason for this limitation was that different LD criteria were used prior to this, and one of

the goals of the study was to look at students identified under the current criteria.

A total of 35 school districts participated in this project, and data were collected on a total of 1074 students identified as LD. This total was reduced by the following additional constraints:

1) At least one of the achievement tests must have been administered a minimum of two times.
2) The first time the test was given must be within +180 days of the date of placement. Thus, the first test is a reasonable measure of performance at the time of placement.
3) The time between the first and second administration of the test was at least 90 days but not greater than 1095 days; this is due to the time ranges used in the study.

These constraints reduced to 326 the total number of students whose data are included in the present study.

Test and Demographic Information

Achievement Tests. Preliminary investigation of a small sample of LD students' cumulative files revealed that most achievement testing utilized the following tests:

a. Woodcock Reading Mastery
b. Woodcock-Johnson Psycho-Educational Battery
c. Key Math Diagnostic Achievement Test
d. Peabody Individualized Achievement Test (PIAT)
e. Test of Reading Comprehension (TORC)
f. Test of Written Language (TOWL)

Subsequently, it was found that very little testing using the TORC and TOWL had been done, so that these tests were then dropped from the data collected.

If test scores were not reported as standard scores, they were converted to normal curve equivalents, using tables provided by the Iowa Department of Public Instruction (1981). All of the reported data in the present study use these normal curve equivalent scores.

Intelligence Tests. As with the achievement tests, provision was made to collect data on a variety of intelligence tests. These were:

a. Stanford - Binet

b. Wechsler Intelligence Scale for Children (WISC-R)

c. Wechsler Adult Intelligence Scale (WAIS-R)

d. Wechsler Preschool and Primary Scale of Intelligence (WPPSI)

e. Kaufman Assessment Battery for Children (KABC)

Since almost all of the students received the WISC-R, with virtually none of the other tests given, scores are reported only for the WISC-R.

Demographic Information. The following demographic information was obtained for each student:

a. Birthdate

b. Age

c. Sex

d. School (for grouping by district size)

e. Grade

f. Whether or not the child had been retained, and grade(s) retained.

g. Date of placement

h. Placement program

i. Identified disability area

Data Collection Procedures

The primary sources for the data were the student's cumulative file (at the school), the teacher's file, and, to a lesser extent, the AEA Consultant's file. The data recording forms are presented in Appendix A.

RESULTS

The basic measure of student growth which is used in the present study is the difference between the normalized score on a particular achievement test, given at approximately the time of placement, and the score achieved on the same test at some point in the future; this will be referred to as a difference score. Four different time intervals (the interval between the first and the later administration of the test) were used, resulting in four possible difference scores for any test: 1) 90 - 180 days, 2) 181 - 365 days, 3) 366 - 730 days, 4) 731 - 1095 days. Since the data for the present study were gathered through a review of existing records, and since no guidelines have been in existence concerning the times that these tests should be administered, there is considerable variability in the number of difference scores available for each time interval across test instruments. In some cases, sample size becomes a serious problem; thus, some suggestions are made later in this paper regarding uniformity of testing.

All difference scores reported for the Woodcock Reading Mastery are for total scores; very little additional information accrued from subtest scores. Due to the relatively small number of PIAT's, only total scores for this test are reported. However, for the Woodcock-Johnson, separate scores are reported

for reading cluster, math cluster, written language, and skills.

Table 1 reports the mean difference scores; all scores are normal curve equivalents. The scores are reported for each of the achievement tests, across the four time intervals measured, along with their standard deviations and the number of scores in each cell. It is apparent from the table that very little change in normal curve equivalent scores is occuring, and there is no evidence of improvement over time (across the four time intervals): averaging across tests, the mean score changes for the four time intervals are 2.4, 2.6, 2.7, and 2.7.

To look more closely at the data, they were sorted along several dimensions. Note that due to missing data (occasionally, relevant demographic information was missing or unclear), totals for these tables are not necessarily the same as in Table 1. In Table 2, the data are subdivided by the current program (self contained, resource, or regular education). In Table 3, scores divided by sex are reported. Table 4 reports scores sorted by district size; there were 17 districts designated as small (20 or fewer students identified as LD), 11 middle-sized districts (21-41 LD students), and 7 large districts (62-274 LD students). The final sort was by LD disability area (see Table 5). Here, the data of particular interest are the scores on tests more specifically related to the student's disability. Thus, scores on the Woodcock Reading Mastery and the reading cluster of the Woodcock-Johnson are reported for students sorted as to whether or not reading is identified as a specific disability area; the math cluster of the Woodcock-Johnson, along with the Key Math, are reported for students sorted by having (or not having) math as a disability area; and, finally, the same procedure was followed for written expression (using the written language subscores from the Woodcock-Johnson.).

Since there was no clear pattern of differences between test instruments

(other than Key Math difference scores generally being higher), and due to sample size problems, the data were collapsed across tests for statistical analyses. As might be expected from the small size of the difference scores, the clear result was one of a lack of significant differences between the variables investigated. A two-way ANOVA looking at sex X time period difference revealed no effect of sex [$F(1,1119) = 0.084$, $p>.05$], no effect of time period difference [$F(3,1119) = 0.27$, $p>.05$], and no interaction between the two [$F(3,1119) = 1.17$, $p>.05$]. Similarly, an analysis of district size X time period difference revealed no effect of district size [$F(2,1115) = 0.35$, $p>.05$], nor time period difference [$F(3,1115) = 0.03$, $p>.05$], nor any interaction [$F(6,1115) = 0.22$, $p>.05$]. Finally, an ANOVA performed on the current program X time period difference relationship revealed a marginal effect of current program [$F(1,1119) = 4.01$, $p<.05$], where the mean difference score for resource programs was 2.90, across all tests and time periods, while the mean for self-contained programs was 0.94. Again, there was no effect of time period difference [$F(3,1119) = 0.47$, $p>.05$], and no interaction between the two [$F(3,1119) = 0.91$, $p>.05$].

There were a total of 268 useable WISC-R full-scale scores, but only 8 Stanford-Binet's and 3 WPPSI's; thus, only results for the WISC-R are reported. Only analyses using the full scale of the WISC-R are presented, as there was no apparent benefit from separate analyses of verbal and performance scores. Overall, the mean WISC-R full scale score was 97.7. Correlation coefficients for the relationship between WISC-R full scale scores and difference scores for each of the achievement tests, for each time interval, are shown in Table 6. In general, these correlations are very small, with the larger ones (which were negative) based on very small samples.

To look further at possible effects of IQ, the scores for students were

divided into three groups based on the student's full-scale WISC-R IQ: 1) less than 88 (n=358); 2) 89 - 107 (n=617); 3) 108+ (n=152). Correlations between IQ groups and overall difference scores, for the various achievement tests, are shown in Table 7; again, the correlations are very close to 0.

The final correlation to be reported is between the age of the student at the time of placement and the average rate of improvement (averaged difference scores); again, there is no evidence of a correlation (r=-.009).

DISCUSSION

The most obvious conclusion that can be drawn from the present study is that the LD students in the present study are not making any significant academic progress, relative to their peers, as measured by individualized, norm-referenced tests. On the other hand, there is no evidence of performance decreases relative to their peers, which one might hypothesize would have occurred without placement. Unfortunately, this conclusion is tenuous, at best, since we do not know the shape of the declining function prior to placement, nor do we know the nature of performance that would have occurred if the child had not been placed.

Another problem of interpretation concerns the lack of control over the times that tests are given. If any differences had been found between program types, district sizes, or other variables (although no effects of any substance were observed), it could easily be possible that differences were caused by biases in determining when tests are given. Without control over testing procedures, there is no way to begin to make suggestions as to causality.

An important question which needs to be asked is whether or not better

academic performance can be expected from these students. While there is no obvious answer to this question, there is some evidence in the literature of good performance under certain conditions. One possibility, for example, is that the measurement system itself may have a significant effect on the performance of the students. Several authors (Mirkin, Deno, Tindal and Kuehnle, 1982; Wesson, Deno and Mirkin, 1982; Wesson, King and Deno, 1984) have suggested that better student performance is achieved when an "aim line" (progress toward a goal) is constructed, and performance is measured on a frequent (i.e., daily) basis. Deviations from the aim line that continue for several days would result in a change in approach, in an attempt to move the child steadily toward his or her immediate goal. These authors feel that such an approach is a much better method of measuring student growth than the more traditional method of annually evaluating progress made toward achieving IEP goals and objectives. Several recent papers have noted a number of advantages of the curriculum - based assessment approach at the elementary level (Tucker, 1985; Deno, 1985; Gickling and Thompson, 1985; Germann and Tindal, 1985; Marston and Magnusson, 1985); the method deserves serious consideration by special education professionals.

The results of studies such as these raise an important point in the context of the present study; namely, it may be that the measurement instruments employed (standardized achievement tests) may not be the most appropriate instruments to use. Clearly they are not designed to directly measure IEP progress, and as such may miss significant gains made in other areas which were considered important for the overall education of the child (and which were, therefore, a part of the IEP). For example, an approach which might be used in teaching LD students, especially at the secondary level, emphasizes learning strategies rather than simply attempting to remediate some skill

(such as reading) (Deshler, Schumaker, Alley, Warner and Clark, 1982; Alley, Deshler, Clark, Schumaker and Warner, 1983; Schumaker, Deshler, Alley and Warner, 1983). It would seem clear that focusing only on standardized achievement tests would be an inappropriate measure of student progress in such a program.

It is the problems inherent in standardized testing that are also addressed by the curriculum - based measurement approach. Implementation of such an approach can be all-encompassing, including initial screening, assessment and placement decisions, monitoring student growth, and modifying the student's program (including decisions relating to the termination of special education services) (Deno, 1985; Germann and Tindal, 1985). Clearly, it is impractical and unreasonable to assume that major changes in all of these activities could (or should) be implemented quickly. However, it may be practical (especially at the elementary level) to combine some aspects of frequent and repeated measurement of student progress using curriculum-based methods, together with standardized tests given at less frequent intervals, such as the time of the three-year re-evaluation. Standardized tests given at these points would probably be of some use in deciding whether or not a student is able to deal with academic material at the level of his or her regular education peers. In addition, consistent testing procedures would assist in the evaluation of the efficacy of the whole program. Simple procedures could be implemented for collecting these data, such as brief forms that would be filled out at the time of placement, and also at the three-year re-evaluation, which could be sent directly to the AEA for input into a computer database. Thus, it would be possible to continue to collect data at a minimal cost.

Another point, which is raised by the question of whether or not better performance can be achieved, concerns all of the teacher and classroom vari-

ables which affect the student's performance. Obviously, the number of factors which may be important is extremely large. They range from such things as basic characteristics of the teacher (enthusiasm, friendliness, etc), to activities performed by the teacher (measurement methods utilized, behavior management techniques, etc), to characteristics of the curriculum, to physical characteristics of the classroom and building, to the attitudes of administrators, parents, and other teachers; the list goes on. An understanding of the relative importance of these variables is clearly important if better student growth is to be achieved, although such an undertaking is well beyond the scope of the present project.

In considering the present results, an important point which needs to be remembered is that the present study was not a program evaluation in the typical sense. Many aspects of the learning disabilities programs that may be very important, such as improving social or emotional aspects of the students, improvements in other behaviors of the students, etc, were not investigated. Thus, it would be highly inappropriate to conclude that the programs investigated in this study were of little value since students failed to make progress on standardized achievement tests relative to the progress made by average students.

It goes without saying that a great deal of further work is needed in this area. It is hoped that the present results, in raising some question about the academic growth of learning disabled students, will result in a positive approach to find ways of improving their academic performance and the overall quality of special education programs.

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FOOTNOTES

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Table 1. Means, standard deviations (in parentheses) and sample sizes (in brackets) for norm-equivalent difference scores.

	Time interval (between first testing and later testing), in days				
Achievement test	90 - 180	181 - 365	366 - 730	731 - 1095	Mean
Woodcock Johnson					
Reading cluster	3.4 (4.1) [8]	1.9 (7.7) [102]	2.0 (7.0) [119]	3.2 (6.9) [47]	2.2
Math cluster	4.8 (8.0) [5]	4.2 (11.9) [94]	3.4 (11.2) [113]	0.6 (10.6) [43]	3.3
Written language	-1.5 (5.4) [6]	2.4 (9.5) [90]	2.5 (9.6) [113]	2.9 (9.1) [45]	2.4
Skills cluster	- - [0]	2.2 (11.4) [32]	1.9 (6.2) [33]	4.7 (8.2) [10]	2.4
Woodcock Reading	4.8 (5.5) [9]	1.4 (5.8) [50]	3.4 (7.3) [56]	3.8 (9.4) [32]	2.9
Key Math	0.5 (10.0) [4]	4.0 (10.1) [29]	5.1 (10.3) [34]	4.5 (13.2) [17]	4.4
PIAT	0.5 (4.1) [4]	-0.8 (8.6) [10]	-1.6 (6.7) [18]	-3.0 (4.9) [4]	-1.3
Overall Means	2.4 (5.4) [36]	2.6 (9.5) [407]	2.7 (9.0) [486]	2.7 (9.4) [198]	2.7

Table 2a. Means, standard deviations (in parentheses) and sample sizes (in brackets) for norm-equivalent difference scores on the Woodcock Reading, sorted by type of program.

	Time interval (between first testing and later testing), in days				
Type of program	90 - 180	181 - 365	366 - 730	731 - 1095	Mean
Resource room	4.8 (5.9) [8]	1.6 (5.1) [41]	3.4 (7.1) [47]	3.7 (10.1) [27]	3.0
Self-contained	5.0 (5.0) [1]	-3.0 (6.5) [7]	2.7 (9.8) [7]	4.2 (3.7) [5]	1.2
Regular education	- - [0]	11.0 (4.2) [2]	6.0 (1.4) [2]	- - [0]	8.5
Overall Means	4.8	1.3	3.4	3.8	

Table 2b. Means, standard deviations (in parentheses) and sample sizes (in brackets) for norm-equivalent difference scores on the Woodcock-Johnson (Reading Cluster), sorted by type of program.

	Time interval (between first testing and later testing), in days				
Type of program	90 - 180	181 - 365	366 - 730	731 - 1095	Mean
Resource room	3.4 (4.1) [8]	2.1 (7.8) [92]	2.3 (7.1) [105]	4.2 (6.0) [42]	2.6
Self-contained	- - [0]	-0.5 (7.6) [6]	-2.7 (6.2) [9]	-5.2 (9.0) [5]	-2.7
Regular education	- - [0]	3.5 (10.6) [2]	6.5 (6.4) [2]	- - [0]	5.0
Overall Means	4.1	2.0	2.5	3.2	

Table 2c. Means, standard deviations (in parentheses) and sample sizes (in brackets) for norm-equivalent difference scores on the Woodcock-Johnson (Math Cluster), sorted by type of program.

	Time interval (between first testing and later testing), in days				
Type of program	90 - 180	181 - 365	366 - 730	731 - 1095	Mean
Resource room	4.8 (8.0) [5]	4.3 (12.1) [84]	3.6 (11.0) [101]	0.8 (10.3) [39]	3.4
Self-contained	- - [0]	2.2 (9.4) [6]	-1.0 (15.2) [7]	-2.25 (15.4) [4]	-0.2
Regular education	- - [0]	10.5 (16.3) [2]	16.5 (2.1) [2]	- - [0]	13.5
Overall Means	4.8	4.3	3.5	0.6	

Table 2d. Means, standard deviations (in parentheses) and sample sizes (in brackets) for norm-equivalent difference scores on the Woodcock-Johnson (Written Language), sorted by type of program.

	Time interval (between first testing and later testing), in days				
Type of program	90 - 180	181 - 365	366 - 730	731 - 1095	Mean
Resource room	-1.5 (5.4) [6]	2.6 (9.7) [81]	3.0 (9.6) [101]	3.3 (9.2) [41]	2.8
Self-contained	- - [0]	-3.0 (3.1) [6]	-2.1 (11.1) [7]	-1.5 (7.4) [4]	-2.3
Regular education	- - [0]	14.5 (6.4) [2]	5.5 (2.1) [2]	- - [0]	10.0
Overall Means	-1.5	2.5	2.7	2.9	

Table 2e. Means, standard deviations (in parentheses) and sample sizes (in brackets) for norm-equivalent difference scores on the Woodcock-Johnson (Skills Cluster), sorted by type of program.

	Time interval (between first testing and later testing), in days				
Type of program	90 - 180	181 - 365	366 - 730	731 - 1095	Mean
Resource room	-	2.2	2.4	4.7	2.7
	-	(11.9)	(5.9)	(8.2)	
	[0]	[27]	[27]	[10]	
Self-contained	-	4.3	-3.3	-	0.5
	-	(11.8)	(5.8)	-	
	[0]	[3]	[3]	[0]	
Regular education	-	-4.0	9.0	-	2.5
	-	(0)	(0)	-	
	[0]	[1]	[1]	[0]	
Overall Means	-	2.2	2.0	4.7	

Table 2f. Means, standard deviations (in parentheses) and sample sizes (in brackets) for norm-equivalent difference scores on the Key Math, sorted by type of program.

	Time interval (between first testing and later testing), in days				
Type of program	90 - 180	181 - 365	366 - 730	731 - 1095	Mean
Resource room	2.7 (11.0) [3]	2.7 (9.9) [24]	5.2 (10.6) [28]	5.4 (10.4) [14]	4.3
Self-contained	-6.0 (0) [1]	11.3 (10.6) [4]	4.8 (10.2) [6]	0.3 (25.8) [3]	5.3
Regular education	- - [0]	6.0 (6.0) [1]	- - [0]	- - [0]	6.0
Overall Means	0.5	4.0	5.1	4.5	

Table 2g. Means, standard deviations (in parentheses) and sample sizes (in brackets) for norm-equivalent difference scores on the PIAT, sorted by type of program.

	Time interval (between first testing and later testing), in days				
Type of program	90 - 180	181 - 365	366 - 730	731 - 1095	Mean
Resource room	3.0 (4.2) [2]	-0.1 (9.4) [8]	-1.1 (7.4) [14]	-3.0 (8.5) [2]	-0.6
Self-contained	0.0 (0) [1]	-7.0 (0) [1]	-2.5 (5.0) [2]	-3.0 (0) [1]	-3.0
Regular education	- - [0]	- - [0]	- - [0]	- - [0]	-
Overall Means	2.0	-0.9	-1.2	-3.0	

Table 3a. Means, standard deviations (in parentheses) and sample sizes (in brackets) for norm-equivalent difference scores, sorted by sex. (Males)

Achievement test	Time interval (between first testing and later testing), in days				
	90 - 180	181 - 365	366 - 730	731 - 1095	Mean
Woodcock Johnson Reading cluster	3.4 (4.4) [7]	0.8 (7.3) [81]	1.7 (7.2) [88]	3.3 (7.5) [38]	1.7
Math cluster	6.3 (8.4) [4]	3.8 (11.8) [74]	3.3 (10.7) [81]	0.8 (10.4) [34]	3.1
Written language	-2.8 (4.9) [5]	2.2 (9.9) [70]	1.7 (9.9) [83]	3.6 (8.8) [36]	2.1
Skills cluster	- - [0]	0.7 (11.3) [26]	0.1 (6.1) [23]	4.7 (8.2) [10]	1.1
Woodcock Reading	7.8 (4.6) [5]	1.2 (6.1) [38]	3.5 (7.6) [40]	5.4 (10.2) [21]	3.3
Key Math	-6.0 (0) [1]	5.9 (10.6) [18]	3.7 (10.3) [21]	1.7 (15.0) [11]	3.9
PIAT	0.7 (5.0) [3]	1.0 (9.6) [7]	-0.9 (8.1) [11]	-1.0 (3.5) [3]	-0.2
Overall Means	2.8	2.2	2.2	3.0	

Table 3b. Means, standard deviations (in parentheses) and sample sizes (in brackets) for norm-equivalent difference scores, sorted by sex. (Females)

Achievement test	Time interval (between first testing and later testing), in days				
	90 - 180	181 - 365	366 - 730	731 - 1095	Mean
Woodcock Johnson Reading cluster	3.0 (0) [1]	6.1 (7.9) [21]	2.6 (6.7) [31]	2.7 (4.2) [9]	3.8
Math cluster	-1.0 (0) [1]	5.8 (12.2) [20]	3.6 (12.6) [32]	-0.7 (12.0) [9]	3.6
Written language	5.0 (0) [1]	3.2 (8.5) [20]	4.8 (8.5) [30]	0.3 (10.3) [9]	3.6
Skills cluster	- - [0]	8.8 (10.2) [6]	6.2 (4.1) [10]	- - [0]	7.2
Woodcock Reading	1.0 (4.2) [4]	1.8 (4.6) [12]	3.2 (6.7) [16]	0.8 (7.1) [11]	2.0
Key Math	2.7 (11.0) [3]	0.9 (8.7) [11]	7.4 (10.5) [13]	9.7 (7.6) [6]	5.2
PIAT	0.0 (0) [1]	-5.0 (4.4) [3]	-2.7 4.1) [7]	-9.0 (0) [1]	-3.6
Overall Means	1.7	4.1	3.8	1.8	

Table 4a. Means, standard deviations (in parentheses) and sample sizes (in brackets) for norm-equivalent difference scores on the Woodcock-Johnson (Reading Cluster), sorted by district size.

	Time interval (between first testing and later testing), in days				
District size	90 - 180	181 - 365	366 - 730	731 - 1095	Mean
Large	1.5 (2.1) [2]	1.2 (8.2) [47]	1.9 (7.1) [50]	1.1 (7.3) [14]	1.5
Middle	4.3 (3.8) [4]	2.0 (7.5) [30]	1.0 (6.7) [39]	5.0 (8.2) [17]	2.2
Small	3.5 (7.8) [2]	3.1 (7.1) [25]	3.4 (7.4) [30]	3.1 (4.6) [16]	3.2
Overall Means	3.4	1.9	2.0	3.2	

Table 4b. Means, standard deviations (in parentheses) and sample sizes (in brackets) for norm-equivalent difference scores on the Woodcock-Johnson (Math Cluster), sorted by district size.

	Time interval (between first testing and later testing), in days				
District size	90 - 180	181 - 365	366 - 730	731 - 1095	Mean
Large	6.0 (9.9) [2]	5.2 (12.9) [45]	3.5 (12.2) [48]	-0.2 (10.6) [13]	3.8
Middle	-6.0 (0) [1]	3.1 (10.9) [27]	2.3 (7.6) [36]	1.6 (11.5) [14]	2.3
Small	9.0 (1.4) [2]	3.7 (11.1) [22]	4.5 (13.2) [29]	0.3 (10.5) [16]	3.4
Overall Means	4.8	4.2	3.4	0.6	

Table 4c. Means, standard deviations (in parentheses) and sample sizes (in brackets) for norm-equivalent difference scores on the Woodcock-Johnson (Written Language) sorted by district size.

	Time interval (between first testing and later testing), in days				
District size	90 - 180	181 - 365	366 - 730	731 - 1095	Mean
Large	-0.5 (7.8) [2]	2.6 (11.1) [43]	1.7 (10.2) [47]	3.6 (9.8) [14]	2.3
Middle	-0.7 (5.5) [3]	2.7 (6.4) [27]	2.9 (9.7) [36]	1.3 (5.7) [16]	2.4
Small	-6.0 (0) [1]	1.8 (9.8) [20]	3.4 (8.8) [30]	4.0 (11.4) [15]	2.9
Overall Means	-1.5	2.4	2.5	2.9	

Table 4d. Means, standard deviations (in parentheses) and sample sizes (in brackets) for norm-equivalent difference scores on the Woodcock-Johnson (Skills Cluster) sorted by district size.

	Time interval (between first testing and later testing), in days				
District size	90 - 180	181 - 365	366 - 730	731 - 1095	Mean
Large	- - [0]	3.0 (13.1) [23]	1.9 (5.8) [24]	4.0 (11.3) [5]	2.6
Middle	- - [0]	0.8 (2.9) [4]	2.0 (7.5) [5]	3.0 (4.6) [3]	1.8
Small	- - [0]	0.0 (6.2) [5]	2.3 (8.5) [4]	9.0 (0) [2]	2.5
Overall Means	-	2.2	1.9	4.7	

Table 4e. Means, standard deviations (in parentheses) and sample sizes (in brackets) for norm-equivalent difference scores on the Woodcock Reading, sorted by district size.

	Time interval (between first testing and later testing), in days				
District size	90 - 180	181 - 365	366 - 730	731 - 1095	Mean
Large	4.8 (5.9) [8]	1.9 (6.1) [39]	4.1 (7.6) [41]	4.6 (10.2) [22]	3.5
Middle	5.0 (0) [1]	3.0 (2.8) [2]	-3.0 (7.1) [2]	-1.5 (10.7) [4]	-0.1
Small	- - [0]	-1.2 (3.9) [9]	2.2 (6.4) [13]	4.5 (3.1) [6]	1.6
Overall Means	4.8	1.4	3.4	3.8	

Table 4f. Means, standard deviations (in parentheses) and sample sizes (in brackets) for norm-equivalent difference scores on the Key Math, sorted by district size.

	Time interval (between first testing and later testing), in days				
District size	90 - 180	181 - 365	366 - 730	731 - 1095	Mean
Large	2.7 (11.0) [3]	3.6 (7.1) [20]	5.2 (10.6) [23]	2.4 (13.2) [12]	3.9
Middle	-6.0 (0) [1]	0.0 (19.4) [4]	3.4 (10.7) [7]	11.0 (14.8) [4]	3.9
Small	- - [0]	9.0 (12.0) [5]	7.8 (10.6) [4]	4.0 (0) [1]	8.0
Overall Means	0.5	4.0	5.1	4.5	

Table 4g. Means, standard deviations (in parentheses) and sample sizes (in brackets) for norm-equivalent difference scores on the PIAT, sorted by district size.

	Time interval (between first testing and later testing), in days				
District size	90 - 180	181 - 365	366 - 730	731 - 1095	Mean
Large	0.5 (4.1) [4]	-0.9 (9.4) [8]	0.0 (6.8) [11]	-3.0 (4.9) [4]	-0.6
Middle	- - [0]	4.0 (0) [1]	-2.0 (2.0) [3]	- - [0]	-0.5
Small	- - [0]	-5.0 (0) [1]	-5.8 (8.1) [4]	- - [0]	
Overall Means	0.5	-0.8	-1.6	-3.0	

Table 5a. Means, standard deviations (in parentheses) and sample sizes (in brackets) for norm-equivalent difference scores for students sorted by the presence or absence of a specific reading disability.

Disability area/ Achievement test	Time interval (between first testing and later testing), in days				
	90 - 180	181 - 365	366 - 730	731 - 1095	Mean
<u>Reading Disability</u>					
Woodcock Reading	6.3 (4.9) [7]	1.1 (6.0) [36]	3.5 (8.2) [39]	3.9 (10.9) [23]	3.0
Woodcock-Johnson (Reading cluster)	1.5 (2.6) [6]	1.7 (8.5) [64]	1.3 (6.9) [81]	2.5 (6.7) [29]	1.7
Overall means (Reading disability)	4.1	1.5	2.0	3.1	
<u>No Reading Disability</u>					
Woodcock Reading	-0.5 (5.0) [2]	2.1 (5.4) [14]	3.2 (4.9) [17]	3.6 (3.6) [9]	2.7
Woodcock-Johnson (Reading cluster)	9.0 (0) [2]	2.2 (6.4) [38]	3.3 (7.4) [38]	4.3 (7.3) [18]	3.2
Overall Means (No reading disability)	4.3	2.2	3.3	4.0	

Table 5b. Means, standard deviations (in parentheses) and sample sizes (in brackets) for norm-equivalent difference scores for students sorted by the presence or absence of a specific math disability.

Disability area/ Achievement test	Time interval (between first testing and later testing), in days				
	90 - 180	181 - 365	366 - 730	731 - 1095	Mean
Math Disability					
Key Math	-2.7 (9.5) [3]	5.3 (10.0) [14]	6.1 (9.2) [17]	4.7 (15.6) [9]	4.9
Woodcock-Johnson (Math cluster)	1.0 (9.9) [2]	4.5 11.8) [40]	3.0 (11.3) [41]	-0.5 (10.5) [15]	3.0
Overall means (Math disability)	-1.2	4.7	3.9	1.5	
No Math Disability					
Key Math	10.0 (0) [1]	3.7 (10.2) [14]	4.7 (11.7) [16]	6.1 (10.7) [7]	4.7
Woodcock-Johnson (Math cluster)	7.3 (7.4) [3]	4.4 (12.0) [53]	3.6 (11.2) [72]	1.1 (10.8) [28]	3.5
Overall Means (No math disability)	8.0	4.2	3.8	2.1	

Table 5c. Means, standard deviations (in parentheses) and sample sizes (in brackets) for norm-equivalent difference scores for students sorted by the presence or absence of a specific written expression disability.

Disability area/ Achievement test	Time interval (between first testing and later testing), in days				
	90 - 180	181 - 365	366 - 730	731 - 1095	Mean
Written Expression Disability					
Woodcock-Johnson (WE cluster)	-3.5 (3.5) [2]	2.3 (9.4) [59]	2.8 (8.9) [72]	3.2 (9.4) [33]	2.6
No Written Expression Disability					
Woodcock-Johnson (WE cluster)	-0.5 (6.4) [4]	2.8 (10.0) [31]	2.1 (10.8) [41]	2.2 (8.5) [12]	2.2

Table 6. Correlations between achievement test difference scores and WISC-R Full Scale scores (number of observations in brackets).

Achievement test	Time interval (between first testing and later testing), in days			
	90 - 180	181 - 365	366 - 730	731 - 1095
Woodcock Johnson				
Reading cluster	-.579 [7]	-.026 [81]	.143 [84]	.275 [36]
Math cluster	-.013 [4]	-.033 [75]	.236 [82]	-.106 [32]
Written language	-.091 [6]	-.130 [71]	-.075 [79]	.250 [34]
Skills cluster	- [0]	-.207 [24]	-.011 [22]	.139 [7]
Woodcock Reading	-.436 [7]	.193 [46]	-.051 [55]	.010 [30]
Key Math	-.450 [3]	.181 [26]	.212 [33]	.115 [16]
PIAT	-.524 [3]	-.009 [8]	.001 [16]	.000 [2]

Table 7. Correlations between achievement test difference scores and IQ Group (number of observations in brackets).

Achievement test	Correlation coefficient
Woodcock Johnson	
Reading cluster	.108 [276]
Math cluster	.035 [255]
Written language	-.024 [254]
Skills cluster	-.020 [75]
Woodcock Reading	.019 [147]
Key Math	.021 [84]
PIAT	.136 [36]

APPENDIX A

LD PROJECT PROFILE

Student: Sex:
Student Identification No.: Student Sequence No.:
Birthdate: Age: School:
Teacher: Grade:

Retention: _____yes _____no Grade (s) retained:_____

Date of Placement:_____ Program/Classification:_____

_____ _____

_____ _____

_____ _____

_____ _____

Identified Disability Area:

School Readiness _____ Math _____
Listening Comprehension ____
Reading ____ Calculation ____
Basic Reading Skills ____ Reasoning ____
Reading Comprehension ____
Other:_____ Written Expression _____

Specific Test Measures:

Intelligence

SB	Date_____	IQ_____			
WPPSI	Date_____	Verbal____	Performance____	Full Scale____	
WISC-R	Date_____	Verbal____	Performance____	Full Scale____	
	_____	____	____	____	
	_____	____	____	____	
	_____	____	____	____	
WAIS	Date_____	Verbal____	Performance____	Full Scale____	
	_____	____	____	____	
KABS	Date_____				

.Page Two

Student's Name:
Student's Identification No.:

Diagnostic Measures:

Woodcock Reading Mastery: Grade Admin._____ Month/Year Admin. _____
Form:_____
Student's Sequence No.:_____

	Raw Score	Grade Equiv.	NCE	SGS
Letter Identification				
Word Identification				
Word Attack				
Word Comprehension				
Passage Comprehension				
Total Test				

Woodcock Reading Mastery: Grade Admin._____ Month/Year Admin._____
Form:_____
Student's Sequence No.:_____

	Raw Score	Grade Equiv.	NCE	SGS
Letter Identification				
Word Identification				
Word Attack				
Word Comprehension				
Passage Comprehension				
Total Test				

Woodcock Reading Mastery: Grade Admin._____ Month/Year Admin. _____
Form:_____
Student's Sequence No.:_____

	Raw Score	Grade Equiv.	NCE	SGS
Letter Identification				
Word Identification				
Word Attack				
Word Comprehension				
Passage Comprehension				
Total Test				

Page Three
Diagnostic Measures, continued

Student's Name:
Student's Identification No.:

Woodcock-Johnson Psychoeducational Battery: Grade Admin._____Month/Year Admin._____
Student's Sequence No._____

	Grade Equivalent	SGS
Reading Cluster	_____	_____
Math Cluster	_____	_____
Written Language	_____	_____
Skills Cluster	_____	_____

Woodcock-Johnson Psychoeducational Battery: Grade Admin._____Month/Year Admin._____
Student's Sequence No._____

	Grade Equivalent	SGS
Reading Cluster	_____	_____
Math Cluster	_____	_____
Written Language	_____	_____
Skills Cluster	_____	_____

Woodcock-Johnson Psychoeducational Battery: Grade Admin._____Month/Year Admin._____
Student's Sequence No._____

	Grade Equivalent	SGS
Reading Cluster	_____	_____
Math Cluster	_____	_____
Written Language	_____	_____
Skills Cluster	_____	_____

Woodcock-Johnson Psychoeducational Battery: Grade Admin._____Month/Year Admin._____
Student's Sequence No._____

	Grade Equivalent	SGS
Reading Cluster	_____	_____
Math Cluster	_____	_____
Written Language	_____	_____
Skills Cluster	_____	_____

Page Four
Diagnostic Measures, Continued

Student's Name:
Student's Identification No.:

Key Math Diagnostic Arithmetic Test:Grade Admin._____Month/Year Admin._____
Student's Sequence No._____

Raw Score	Grade Equivalent	Percentage	SGS
_____	_____	_____	_____

Key Math Diagnostic Arithmetic Test:Grade Admin._____Month/Year Admin._____
Student's Sequence No._____

Raw Score	Grade Equivalent	Percentage	SGS
_____	_____	_____	_____

Key Math Diagnostic Arithmetic Test:Grade Admin._____Month/Year Admin._____
Student's Sequence No._____

Raw Score	Grade Equivalent	Percentage	SGS
_____	_____	_____	_____

Key Math Diagnostic Arithmetic Test:Grade Admin._____Month/Year Admin._____
Student's Sequence No._____

Raw Score	Grade Equivalent	Percentage	SGS
_____	_____	_____	_____

Key Math Diagnostic Arithmetic Test:Grade Admin._____Month/Year Admin._____
Student's Sequence No._____

Raw Score	Grade Equivalent	Percentage	SGS
_____	_____	_____	_____

Key Math Diagnostic Arithmetic Test:Grade Admin._____Month/Year Admin._____
Student's Sequence No._____

Raw Score	Grade Equivalent	Percentage	SGS
_____	_____	_____	_____

Key Math Diagnostic Arithmetic Test:Grade Admin._____Month/Year Admin._____
Student's Sequence No._____

Raw Score	Grade Equivalent	Percentage	SGS
_____	_____	_____	_____

Key Math Diagnostic Arithmetic Test:Grade Admin._____Month/Year Admin._____
Student's Sequence No._____

Raw Score	Grade Equivalent	Percentage	SGS
_____	_____	_____	_____

Page Five
Diagnostic Measures, Continued

Student's Name:
Student's Identification No.:

PIAT: Grade Admin._____**Month/Year Admin.**_____
Student's Sequence No. _____

	Raw Score	Grade Equiv.	Percentage	SGS
Math				
Reading Recognition				
Reading Comprehension				
Spelling				
General Information				
Total				

PIAT: Grade Admin._____**Month/Year Admin.**_____
Student's Sequence No. _____

	Raw Score	Grade Equiv.	Percentage	SGS
Math				
Reading Recognition				
Reading Comprehension				
Spelling				
General Information				
Total				

PIAT: Grade Admin._____**Month/Year Admin.**_____
Student's Sequence No. _____

	Raw Score	Grade Equiv.	Percentage	SGS
Math				
Reading Recognition				
Reading Comprehension				
Spelling				
General Information				
Total				

PIAT: Grade Admin._____**Month/Year Admin.**_____
Student's Sequence No. _____

	Raw Score	Grade Equiv.	Percentage	SGS
Math				
Reading Recognition				
Reading Comprehension				
Spelling				
General Information				
Total				

Page Six
Diagnostic Measures, Continued

Student's Name:
Student's Identification No.:

TOWL: Grade Admin._____ Month/Year Admin._____
Student's Sequence No._____

Written Language Quotient
_____

TOWL: Grade Admin._____ Month/Year Admin._____
Student's Sequence No._____

Written Language Quotient
_____

TOWL: Grade Admin._____ Month/Year Admin._____
Student's Sequence No._____

Written Language Quotient
_____

TOWL: Grade Admin._____ Month/Year Admin._____
Student's Sequence No._____

Written Language Quotient
_____

TOWL: Grade Admin._____ Month/Year Admin._____
Student's Sequence No._____

Written Language Quotient
_____

TOWL: Grade Admin._____ Month/Year Admin._____
Student's Sequence No._____

Written Language Quotient
_____

TOWL: Grade Admin._____ Month/Year Admin._____
Student's Sequence No._____

Written Language Quotient
_____

Page Seven
Diagnostic Measures, Continued

Student's Name:
Student's Identification No.:

TORC: Grade Admin._____ Month/Year Admin._____
Student's Sequence No._____

Reading Comprehension Quotient

_____

TORC: Grade Admin._____ Month/Year Admin._____
Student's Sequence No._____

Reading Comprehension Quotient

_____

TORC: Grade Admin._____ Month/Year Admin._____
Student's Sequence No._____

Reading Comprehension Quotient

_____

TORC: Grade Admin._____ Month/Year Admin._____
Student's Sequence No._____

Reading Comprehension Quotient

_____

TORC: Grade Admin._____ Month/Year Admin._____
Student's Sequence No._____

Reading Comprehension Quotient

_____

TORC: Grade Admin._____ Month/Year Admin._____
Student's Sequence No._____

Reading Comprehension Quotient

_____